I CLAIM:

1. A method of heating a subterranean formation comprising:

   (a) forming a hole into said formation;

   (b) inserting into said hole a heater comprising a casing and plural fuel cells contained within said casing;

   (c) operating said fuel cells so as to produce heat and electricity; and

   (d) wherein the said formation, when heated, generates a gaseous product, and wherein said gaseous product is provided to and used by said fuel cells as fuel.

2. The heating method of claim 1, wherein, at least after an initial start-up period, said fuel cells are fueled by about 10% or more of the gaseous product generated by the formation.

3. The heating method of claim 1, wherein said casing has an outside diameter, and said hole has an inside diameter at least somewhat greater than said casing outside diameter, thereby defining therebetween a substantially annular gap, and said method further comprises the step of filing said gap with a thermally conductive substance.

4. The heating method of claim 1, wherein said formation is to be heated at a specified rate per heater segment, and wherein said heater segment is adapted to produce a thermal output substantially equal to that specified for the formation.

5. The heating method of claim 4, wherein said heater segment would have greater than desired combined thermal output if said fuel cells were configured continuously within said segment, and said adaptation is achieved by interleaving spacers within said fuel cells.

6. The heating method of claim 4, wherein each of said fuel cells has a thickness and an active component surface area, and wherein said adaptation is achieved by reducing said surface area in proportion to said thickness whereby said fuel cells when arranged continuously produce a combined thermal output substantially equal to that specified.

7. The heating method of claim 1 further comprising inserting additional electricity powered heaters into the formation and using the electrical output of at least some of said fuel cells to power said electrically powered heaters.

8. The heating method of claim 1, wherein said fuel cells generate a relatively warm exhaust gas, and wherein said method further comprises collecting said exhaust gas and using it to heat the formation.

9. A method of heating a subterranean formation comprising:

(b) (a) forming a hole into said formation; inserting into said hole a heater comprising a casing and plural fuel cells contained within said casing;

(c) operating said fuel cells so as to produce heat and electricity; and

(d) continuously supplying said fuel cells with an oxidant and fuel via a continuous conduit to a planetary surface.

10. A subterranean formation heater comprising:

a casing having a plurality of fuel cells;

wherein the fuel cells have a feedback connection to the subterranean formation for receiving a fuel from the subterranean formation; and

wherein at least a portion of a total fuel used to power the fuel cells is supplied via the feedback connection.

11. A subterranean formation heater comprising:

a casing having a plurality of fuel cells;

an oxidant conduit and a fuel conduit connected directly to or near a planetary surface; and

wherein the fuel cells run in a continuous and/or intermittent process mode as fed by a continuous and/or intermittent supply of the oxidant and the fuel passing through said conduits.

12. A conduction heater comprising:

a plurality of fuel cells;

a plurality of conduits, each conduit being in gaseous communication with at least one of said fuel cells;

a manifold comprising conduits but no fuel cells; and wherein the manifold connects a planetary surface to the plurality of fuel cells.

13. The heater of claim 12, wherein at least one of said manifold conduits conducts relatively warmer gas away from said fuel cells and at least one of said conduits conducts relatively cooler gas towards said fuel cells, and wherein said manifold is adapted to transfer heat from said warmer gas to said cooler gas.

14. The heater of claim 12, wherein said manifold comprises thermal insulation to inhibit transfer of heat from said manifold to a surrounding environment.

15. A conduction heater for heating a subterranean formation, said conduction heater comprising:

a plurality of fuel cells;

a plurality of conduits, each conduit being in gaseous communication with at least one of said fuel cells;

a casing enclosing said fuel cells;

each of said fuel cells comprises an anode and a cathode separated by an electrolyte;

at least some of said fuel cells are electrically coupled in a series;

wherein each of said fuel cells comprises at least one plate having plural holes formed therein, at least one of said holes in gaseous communication with said fuel cell;

wherein said conduits are formed by aligning corresponding of said holes in each of said fuel cells to form a continuous passageway;

wherein said plates are assembled into a stack module; and

wherein the stack modules are interconnectable in a linearly scalable manner, thereby providing a desired length for the conduction heater.

16. A conductive heater comprising:

a fuel cell ceramic mounted in a plate;

a vertical assembly of plates forming a stack which is mounted in a casing;

each casing having an end connector, thereby forming a geothermic fuel cell module; and

wherein a plurality of geothermic fuel cell modules are assembled end to end to form a conductive heater of a desired length.

17. The conductive heater of claim 16, wherein each plate has a plurality of holes, thereby forming a plurality of conduits within the casing, at least one of the conduits forming an exhaust conduit, wherein exhaust gases are conveyed in a gaseous state to a planetary surface.

18. A conductive heater comprising:

a fuel cell ceramic mounted in a plate;

a vertical assembly of plates forming a stack which is mounted in a casing;

wherein each plate has a plurality of holes, thereby forming a plurality of conduits within the casing;

at least one of the conduits forming an exhaust conduit; and

wherein exhaust gases are conveyed in a gaseous state to a planetary surface.

19. A conductive heater comprising:

a fuel cell ceramic mounted in plate;

a vertical assembly of plates forming a stack which is mounted in a casing;

wherein a stack is assembled to form a conductive heater of a desired length; and

wherein said stack has a plurality of conduits connected to a planetary surface for feeding fuel to the fuel cells.

20. The conductive heater of claim 19, wherein each plate has a plurality of holes, thereby forming a plurality of conduits within the casing, at least one of the conduits forming an exhaust conduit, wherein exhaust gases are conveyed in a gaseous state to a planetary surface.

21. A conductive heater comprising:

a plurality of conduits in a borehole;

said plurality of conduits communicating from a planetary surface to a plurality of fuel cells in the borehole;

wherein the conduits provide a passageway for at least an oxidant and a fuel for the fuel cells; and

wherein a quantity of the plurality of fuel cells is selected to provide a desired heat output.

22. The conductive heater of claim 21 further comprising a segment of the plurality of conduits which forms a manifold not comprising a fuel cell.

23. The conductive heater of claim 22, wherein the manifold further comprises a heat exchanger.

24. A method to start up a down hole conduction heater, comprising the steps of:

forming a stack of fuel cells in a casing;

inserting the stack down a borehole;

feeding the stack with a plurality of conduits to supply an oxidant and fuel to the stack; and

bringing a temperature of the stack up to an operating temperature in the range of about 750°C to about 1000°C.

25. The method of claim 24 further comprising the step of circulating a preheated fluid through at least one conduit for bringing the temperature of the stack up.

26. The method of claim 24 further comprising the step of using a voltage applied to the stack for bringing the temperature of the stack up.

27. A conductive heater for heating an underground resource layer to facilitate mining the underground resource layer, the conductive heater comprising:

a plurality of conduits connecting a planetary surface to a plurality of fuel cell assemblies;

wherein each of said fuel cell assemblies has a heat generating wafer;

said plurality of conduits further comprising a fuel conduit, an oxidant conduit, and an exhaust conduit;

and wherein each of said fuel cell assemblies further comprise a network of channels adjacent a cathode side of the wafer, thereby feeding the oxidant to every part of the cathode side of the wafer.

28. The apparatus of claim 27, wherein the network of channels further comprise ridges defining the network of channels, and wherein the ridges support the wafer and provide electrical contact from the cathode side of the wafer to the fuel cell assembly.

29. The apparatus of claim 28, further comprising a network of channels and ridges adjacent an anode side of the wafer, said network of channels adjacent the anode side of the wafer conducting fuel from the fuel conduit to the anode side of the wafer.

30. The apparatus of claim 29, wherein the ridges adjacent the anode side of the wafer provide electrical contact from the anode side of the wafer to the fuel cell assembly.

31. The apparatus of claim 30, wherein the fuel cell assemblies each further comprise a pair of interconnect plates and gaskets all having aligned holes forming the plurality of conduits.

32. The apparatus of claim 31, wherein said interconnect plates and gaskets have interconnect bolts therethrough to form a stack of fuel cell assemblies.

33. The apparatus of claim 32, wherein each stack has a male connector end and a female connector end, and

wherein a plurality of stacks connected end to end form a stick of fuel cell assemblies.

34. The apparatus of claim 33, wherein each stick further comprises an exterior casing, thereby protecting the fuel cell assemblies.

35. The apparatus of claim 34 further comprising a preheater means functioning to bring the stick to an operating temperature.

36. The apparatus of claim 35, wherein the stick has length selected to provide a chosen amount of heat to the underground resource layer.

37. The apparatus of claim 36 further comprising spacer plates having aligned holes with the interconnect plates, said spacer plates selectively reducing a heat output of the stick.

38. The apparatus of claim 36, wherein a plurality of sticks connected end to end form a string of fuel cell assemblies having a length selected to heat all or part of the underground resource layer.

39. The apparatus of claim 34 further comprising a manifold connecting the string to the planetary surface, said manifold having the plurality of conduits in close proximity with each other to transfer heat from the exhaust conduit to the oxidant conduit.

40. The apparatus of claim 38 further comprising an insulated current return cable attached to a bottom of the string, thereby forming a useful electric potential between a top of the string and the cable.

41. A fuel cell assembly comprising: an interconnect plate having a peripheral edge;

said interconnect plate having a heat conductive structure;

a plurality of fuel cells mounted adjacent to the peripheral edge, thereby transmitting heat to the peripheral edge; and

a plurality of channels to the fuel cell to provide fuel and an oxidant and to transport exhaust gases.

42. The apparatus of claim 41, wherein the interconnect plated further comprises a plurality of holes which form a plurality of conduits when a plurality of interconnect plates are stacked.

43. A subterranean conductive heater comprising:

a plurality of conduits arranged wherein at least two conduits are spaced apart and parallel to one another;

a plurality of fuel cell assemblies supported between the at least two conduits which are spaced apart;

and wherein the conduits communicate from a planetary surface to the plurality of fuel cells a fuel and an oxidant.

44. A subterranean conductive heater comprising:

a plurality of parallel conduits, at least two members of the conduits adjacent one another to exchange heat therebetween; and

a plurality of fuel cell assemblies supported outbound of the plurality of parallel conduits so as to receive a fuel and an oxidant from the conduits and to transmit heat to the conduits and to transmit heat outbound.

45. The apparatus of claim 44, wherein the plurality of fuel cell assemblies each further comprise a ring shape.